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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/867,758	05/31/2001	Kenichi Nishikawa	040894-5665	6103

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EXAMINER

LEURIG, SHARLENE L

ART UNIT	PAPER NUMBER
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2879

DATE MAILED: 11/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/867,758	NISHIKAWA, KENICHI	
	<b>Examiner</b>	<b>Art Unit</b>	
	Sharlene Leurig	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 September 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2 and 4-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 4-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All   b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                     | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                            | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>0903</u> . | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Allowable Subject Matter***

1. The indicated allowability of claims 1, 2 and 4-9 is withdrawn in view of the newly discovered reference(s) to Hikata (JP 11-106234) (of record). Rejections based on the newly cited reference(s) follow.

### ***Examiner's Notes***

2. The preamble of claim 7 currently contains the word "compromises". The Examiner believes the intended word is "comprises." Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 2 and 4-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hikata (JP 11-106234) (of record) in view of Sugimoto et al. (JP 2000-048931).

Regarding claim 1, Hikata discloses an alumina insulator for a spark plug, wherein at least a part of the surface of the insulator is covered with a glaze layer comprising oxides. The glaze layer features a Si component in terms of SiO<sub>2</sub> in an amount of 30-70 mol%, including values within the claimed range of 35 to 55 mol%, as shown in Tables 1 and 2, a B component in terms of B<sub>2</sub>O<sub>3</sub> in an amount of 1 to 55

mol%, including values within the claimed range of 15 to 35 mol%, as shown in Tables 1 and 2, a Zn component in terms of ZnO in an amount of 0 to 30 mol%, including values within the claimed range of claimed range of 5 to 20 mol%, as shown in Tables 1 and 2, at least one of a Ba component in terms of BaO or an Sr component in terms of SrO, in an amount of 0 to 30 mol%, including values within the claimed range of 0.5 to 20 mol% total, as shown in Tables 1 and 2, and 10 to 15 mol% of a combination of alkaline metal components of Na, K and Li in terms of Na<sub>2</sub>O, K<sub>2</sub>O, or Li<sub>2</sub>O. The glaze layer contains the Li component and at least two alkaline metal components among the Li, Na and K components, and satisfies the relationship:  $0.2 < N \text{ Li}_2\text{O} / N \text{ R}_2\text{O} < 0.5$ , where NR<sub>2</sub>O is a total mole content of the at least two alkaline metals. Hikata discloses a ratio of at least two of the alkaline metal components in a ratio of 1/1 to 1/3 (abstract). Therefore if the ratio of Li<sub>2</sub>O to K<sub>2</sub>O is 1/3, this is equivalent to 0.33 and therefore fits within the claimed range.

Hikata further discloses a spark plug not containing lead. However, the claim recites the limitation of a spark plug having 1 mol% or less of a Pb component in terms of PbO, which includes a spark plug having no Pb component.

Regarding claim 2, Hikata discloses a spark plug having an alumina insulator with a glaze layer comprising the oxides discussed above with regard to claim 1, and additionally comprising the K component and at least two alkaline metal components among the Li, Na and K components, and satisfies the relationship:  $0.4 < N \text{ K}_2\text{O} / N \text{ R}_2\text{O} < 0.8$ , where NR<sub>2</sub>O is a total mole content of the at least two alkaline metals. Hikata discloses a ratio of at least two of the alkaline metal components in a ratio of 1/1 to 1/3

(abstract). Therefore if the ratio of  $K_2O$  to  $Li_2O$  is  $1/2$ , this is equivalent to 0.5 and therefore fits within the claimed range.

Regarding claims 1 and 2, though Hikata discloses an alumina insulator for a spark plug, Hikata lacks disclosure of the spark plug structure.

Sugimoto discloses a spark plug with a center electrode (3), a metal shell (1), and an "alumina-based" insulator (2) disposed between the center electrode and the metal shell and coated with a glaze layer.

Therefore it would have been obvious to provide the spark plug disclosed by Hikata with a center electrode to produce discharge and a metal shell to protect the center electrode, as taught by Sugimoto.

Regarding claim 4, Hikata discloses limitations on the components of the glaze layer that can be combined to satisfy the claimed ratio of  $1.5 \leq N(B_2O_3 + ZnO) / N(REO + R_2O) \leq 3.0$ , where REO represents oxides of Ba, Mg, Ca and Sr, and  $R_2O$  represents oxides of Na, K and Li. If  $B_2O_3$  makes up 20 mol% of the glaze, ZnO makes up 10 mol%, BaO makes up 8 mol%, and a combination of the alkaline metal oxides make up 10% of the glaze, the ratio is equal to 1.67, which falls within the claimed range of 1.5 to 3.0.

Regarding claim 5, Hikata discloses a range of ZnO+BaO+SrO of 11-50 mol% (abstract), which overlaps with the claimed range of 8-30 mol%.

Regarding claim 6, Hikata discloses a glaze layer that contains at least one Zr, Ti and Mg, with a possible maximum total of anywhere between 0.5 to 5 mol%, which fits within the claimed range of 0.5 to 5 mol%, in terms of  $ZrO_2$ ,  $TiO_2$  and MgO (abstract)

Regarding claim 7, Hikata discloses a spark plug having a high insulation resistance, but lacks disclosure of either the spark plug structure or the value of the insulation resistance (abstract).

Sugimoto teaches a spark plug with a glaze layer having a terminal metal fixture and a center electrode as one body in a through-hole of the insulator, or separated from the center electrode via a conductive bonding layer (paragraphs 0040 and 0049). The insulation resistance of the spark plug glaze layer is 200 M $\Omega$  or more, which is measured by keeping the whole of the spark plug at 500 °C and passing a current between the terminal metal fixture and the metal shell via the insulator (paragraphs 0040 and 0116).

Therefore regarding claim 7, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the spark plug disclosed by Hikata with a terminal metal fixture being part of one body with the center electrode or being separated by a layer in order to provide an electrical connection between them, as taught by Sugimoto, and to further modify it with a high insulation resistance of 200 M $\Omega$  or more, in order to prevent flashover, as taught by Sugimoto.

Regarding claim 8, though Hikata discloses an alumina insulating material, Hikata lacks disclosure of the percentage of alumina, and further lacks disclosure of the thermal expansion coefficient of the glaze layer.

Sugimoto teaches an insulator containing Al "in an amount of 85 to 98% by weight as reduced to Al<sub>2</sub>O<sub>3</sub>" in order to provide an insulator with high insulation resistance (paragraph 0042). Sugimoto further teaches a glaze layer for an insulator of

such high alumina content that has an average thermal expansion coefficient of  $5.0 \times 10^{-6}/^{\circ}\text{C}$  to  $8.0 \times 10^{-6}/^{\circ}\text{C}$  as measured within the temperature range from  $20^{\circ}\text{C}$  to  $350^{\circ}\text{C}$ , which falls within the claimed range of  $5.0 \times 10^{-6}/^{\circ}\text{C}$  to  $8.5 \times 10^{-6}/^{\circ}\text{C}$  (paragraph 0042). Such a thermal expansion coefficient range prevents defects such as cracks.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the spark plug disclosed by Hikata with an insulator containing a high percentage of alumina as taught by Sugimoto in order to provide an insulator with high insulation resistance, and to further provide an appropriate glaze layer having a certain thermal expansion coefficient range in order to prevent defects, as taught by Sugimoto.

Regarding claim 9, Hikata discloses a softening point of 550 degrees Celsius, and therefore lacks a softening point of 600 to 700 degrees Celsius.

Sugimoto teaches a glaze layer having a softening point within the range of  $600^{\circ}\text{C}$  to  $700^{\circ}\text{C}$  in order to prevent oxidization of the center electrode and to enable the acquirement of a good glass-seal state (paragraph 0051).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the spark plug disclosed by Hikata with a glaze layer having a softening point of between 600 and 700 degrees Celsius in order to provide a spark plug with as few defects as possible, as taught by Sugimoto.

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sharlene Leurig whose telephone number is (703)305-4745. The examiner can normally be reached on Monday through Friday, 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (703)305-4794. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Sharlene Leurig

  
ASHOK PATEL  
PRIMARY EXAMINER